**39. Proposed by SETH PRATT, C. E., Assyria, Michigan.**

The pendulum of a clock which gains 6 seconds in 1 hour and 13 minute, makes 6000 vibrations in 1 hour and 9½ minutes. What is the length of the pendulum? And what length should it have to keep true time?

**I. Solution by G. B. M. ZERR, A. M., Ph. D., Texarkana, Arkansas-Texas.**

Regarding 1 hour, 13 minutes and 1 hour, 9½ minutes as registered by a clock keeping correct time, $g=32.16$, $\pi=3.1416$, $t=\pi\sqrt{(l/g)}$. Then 1 hour, 9½ minutes=4170 seconds.

$$\therefore\ t=\tfrac{4170}{6000}=\tfrac{139}{200}=\pi\sqrt{\frac{l}{g}}.\qquad \therefore\ l=\frac{(139)^2g}{(200\,\pi)^2}=1.57393 \text{ ft.}=18.88716 \text{ inches.}$$

1 hour, 13 minutes=4380 seconds.

$$\frac{4380\times200}{139}=\text{number of vibrations in 1 hour, 13 seconds.}$$

$$\therefore\ \frac{4380\times200}{139}=4386 \text{ seconds.}$$

$$\therefore\ t'=\frac{4386\times139}{4880\times200}=\frac{731\times139}{730\times200}=\pi\sqrt{\frac{l'}{g}}.$$

$$\therefore\ l'=\frac{(731\times139)^2g}{(730\times200\pi)^2}=1.578243 \text{ feet.}$$

$$\therefore\ l'=18.93892 \text{ inches}=\text{length to keep true time.}$$

**II. Solution by E. W. MORRELL, Professor of Mathematics in Montpelier Seminary, Montpelier, Vermont.**

1 hour and 9½ minutes=4170 seconds. 4170 seconds÷6000=.695 seconds, the time of one vibration. From Mechanics $l=t^2g/\pi^2$, whence $l=18.886$ inches, the length of the pendulum. Again, 1 hour and 13 minutes=4380 seconds. 4380÷.695=876/.139=number of vibrations in 1 hour and 13 minutes. As the pendulum gains 6 seconds in that time, 6÷(876/.139)=.834/876=.0095, the time in seconds gained in one vibration.

∴ .695 seconds+.0095 seconds=.69595 seconds, the time of vibrations of pendulum to keep correct time. Hence by substitutions in the above formula $l=18.9379$ inches, the length of pendulum to keep true time.

[NOTE.—The results sent in with the problem by the Proposer were, 18.89835+ inches, and for true time .036036+ inches longer. Prof. P. S. Berg in his solution obtained for length of pendulum 18.837975 inches, and 22.393 inches as the length to keep true time. EDITOR.]

## PROBLEMS.

**49. Proposed by J. SCHEFFER, A. M., Hagerstown, Maryland.**

Give a general proof that the centre of gravity, or centroid, determines that point from which the sum of the distances to all other points of a given area is the minimum.

**50.** Proposed by J. K. ELLWOOD, A. M., Principal of Colfax School, Pittsburg, Pennsylvania.

Describe and compute the actual path traversed by the moon in July and August, 1896, taking into account the motion of the earth around the sun.

**51.** Proposed by F. M. SHIELDS, Coopwood, Mississippi.

A stock dealer traveled from his home $H$, due north across a lake $L$ 40 miles wide to a city, and bought 156 horses and 177 mules for \$23631; he then traveled farther due north to $A$, and bought at same price 468 horses and 235 mules for \$52245; he then traveled from $A$ due west 130 miles to $B$, and bought 120 cows; he then traveled due north to $C$, and bought 250 sheep; he then traveled from $C$ due èast 330 miles to $D$, and bought 300 goats,—paying 1-4 as much for cows as horses, and 1-9 as much for sheep as mules, and 1-2 as much for goats as sheep; at $D$ he turned and traveled in a straight line to the city, a distance equal to the sum of the entire distance he traveled due north from his home $H$; he sold all his stock at a profit of 20%. How far did he travel from his home $H$ the entire trip around and back to the city? What was the cost of each head of stock, and what was the entire gain?

**52.** Proposed by I. J. WIREBACK, M. D., St. Petersburg, Pennsylvania.

What is the volume of a segment of a right cone, whose diameter is 6 inches and perpendicular 9 inches? The section being parallel with the perpendicular of the cone and includes 1-4 of its circumference at the base.

# NOTES.

## NOTE ON ARTICLE IN AUGUST-SEPTEMBER NUMBER, VOL. III.

BY WARREN HOLDEN.

Referring to the demonstration on page 207 (current volume) without disputing the conclusion, allow me to submit the following considerations:

In Algebra, when zero is a factor in any term, the product is zero. Accordingly $0\times\infty=0$. In the course of the demonstration appears the expression $\frac{0\times1}{0}=\frac{0}{0}$, or the denominators being equal, $0\times1=0$. Would this result affect the conclusion in any way?

## NOTE ON ELIMINATION.

BY J. C. CORBIN, PINE BLUFF, ARKANSAS.

The operation of elimination by addition and subtraction may often be shortened by the process and rule given below:

I. $5x+7y=43.$

$11x+9y=69.$

To eliminate $y$. $(9\times5-7\times11)x=9\times43-7\times69.$ $\because x=3.$

To eliminate $x$. $(11\times7-5\times9)y=11\times43-5\times69.$ $\because y=4.$